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Title: Satellite Image Mapping of Tree Mortality in the Sierra Nevada Region of California from 2013 to 2016

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Abstract

Extreme drought from 2013 to 2015 has been linked to extensive tree dieback in the Sierra-Nevada region of California. Landsat satellite imagery was analyzed for the region from Lake Tahoe to the southern Sequoia National Forest with the objective of understanding the patterns of tree mortality in the years of 2013 to 2015 and into the near-normal precipitation year of 2016. The main mapping results for Landsat moisture index differences from year-to-year showed that the highest coverage of tree dieback was located in the Sierra and Sequoia National Forests, at four to five times greater area each year than within any other National Park or National Forest unit. Since 2013, over 50% of the Sierra Nevada forest dieback area was detected in the mid elevation zone of 1000-2000 m. The total area of tree mortality in the lower elevation zone of 500-1000 m did not grow notably from 2015 to 2016. Within the largest California river drainages in the Sierra region, new tree mortality in 2015 was detected mainly below 1200 m elevation, whereas new tree mortality in 2016 was detected mainly at higher elevations, up to about 2200 m. In three out of the four years studied, results showed that about 60% of all new tree mortality areas were located on north-facing hill slopes.